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Two new fossil Ophiuroid species from the Bokkeveld Series, near Ceres, Cape Province

by

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SYNOPSIS

A new ophiuroid belonging to the Eophiuridae is described as *Haughtonaster reedi* gen. et sp. nov., and a new species, *Taeniaster stuckenbergi*, is described in the Protasteridae. Both are from the Lower Devonian Cape System of South Africa.

INTRODUCTION

The Echinodermata is a phylum which is only poorly represented in the Bokkeveld series of the Lower Devonian Cape System of South Africa. Reed (1925: 30–33) lists one Cystid, one Blastoid, two Asteroids (the subject of this paper), one Crinoid and the isolated stems of another, Rennie (1936: 269–275) has redescribed the Cystid, while Rossouw (1933: 75) and Spencer (1950: 300) have each added an Ophiuroid.

The collections of the South African Museum at Cape Town contain two small, soft, brownish, fine to medium-grained sandstone slabs, No. 3375, roughly 5 cm broad by 6 cm long and No. 3881 roughly 5 cm square which each contain as a cast an impression of what, at first sight, appears to be a starfish but on closer examination proves to be an Ophiuroid. The smaller of these specimens is sufficiently distinct to determine. Reed (1925: 32–33) listed these as *Echinasterella* sp.; he did not erect a new species. In the light of more recent research, it is no longer possible to refer these specimens to the genus *Echinasterella*, nor is it possible to assign them to any other genus. Therefore in order to contain the specimens, it is proposed to create a new genus, *Haughtonaster*, in honour of the collector, Sidney Haughton, formerly Director of the Geological Survey, and to erect a new species, *reedi*.

The collections of the Natal Museum at Pietermaritzburg contain a roughly rectangular black mudstone slab, 12 cm long, 6,5 cm broad and 3 cm thick, which preserves the casts of four slightly compressed but reasonably distinct Ophiuroids, together with portions of other individuals. The slab has been subjected to dynamic metamorphism with the result that the joints are much better developed than the bedding planes; the metamorphism has also hardened the rock, with the result that it can just be scratched by fluourite but scratches calcite readily. The matrix is homogeneous, very fine-grained and contains an occasional flake of mica. The fine-grained nature of the matrix has enabled the soft parts of the animal to be indicated. This specimen has had a somewhat chequered history; it was originally submitted to the British Museum (N.H.) in 1927 and referred to the late W. K. Spencer, who died before he could determine it. It was returned to the Natal Museum in 1963. On lithological grounds the specimen can be regarded as Bokkeveld; furthermore, as the animals transgress the bedding planes the specimen is better regarded as a colony of burrowing organisms than a collection of animals which indulged in suspension feeding. We should expect such a colony to come from the littoral facies, and the Cold Bokkeveld, north of Ceres, the locality of this specimen, is close to if not actually a portion of the littoral facies. This Ophiuroid is identical to the form listed by Reed as *Aspidosoma* sp.; Reed's specimen, Albany Museum No. 2610, consists of portions of two indistinct individuals preserved as casts in a medium-grained grey micaceous argillaceous sandstone. Reed did not institute a new species; therefore it is proposed now to do so, in order to contain the individuals on both the Natal Museum and Albany Museum slabs, and to name the species *stuckenbergi* in order to mark the very real assistance given to the author by Brian Stuckenberg of the Natal Museum.

SYSTEMATIC DESCRIPTIONS

SUBCLASS	OPHIUROIDEA	Gray (1840)
Order	Stenurida	Spencer (1951)
Suborder	Parophiurina	Jaekel (1923)
Family	Eophiuridae	Schöndorf (1910)
Genus	**Haughtonaster**	gen. nov.

Haughtonaster reedi gen. et sp. nov.

1925 *Echinasterella* sp. F. R. C. Reed *Ann. S. Afr. Mus.* **22**: 32–33.

Generic characters: Stelliform ophiuroids with alternating ambulacrals and blunt tips to the rays.

Type species: *Haughtonaster reedi* sp. nov. described below.

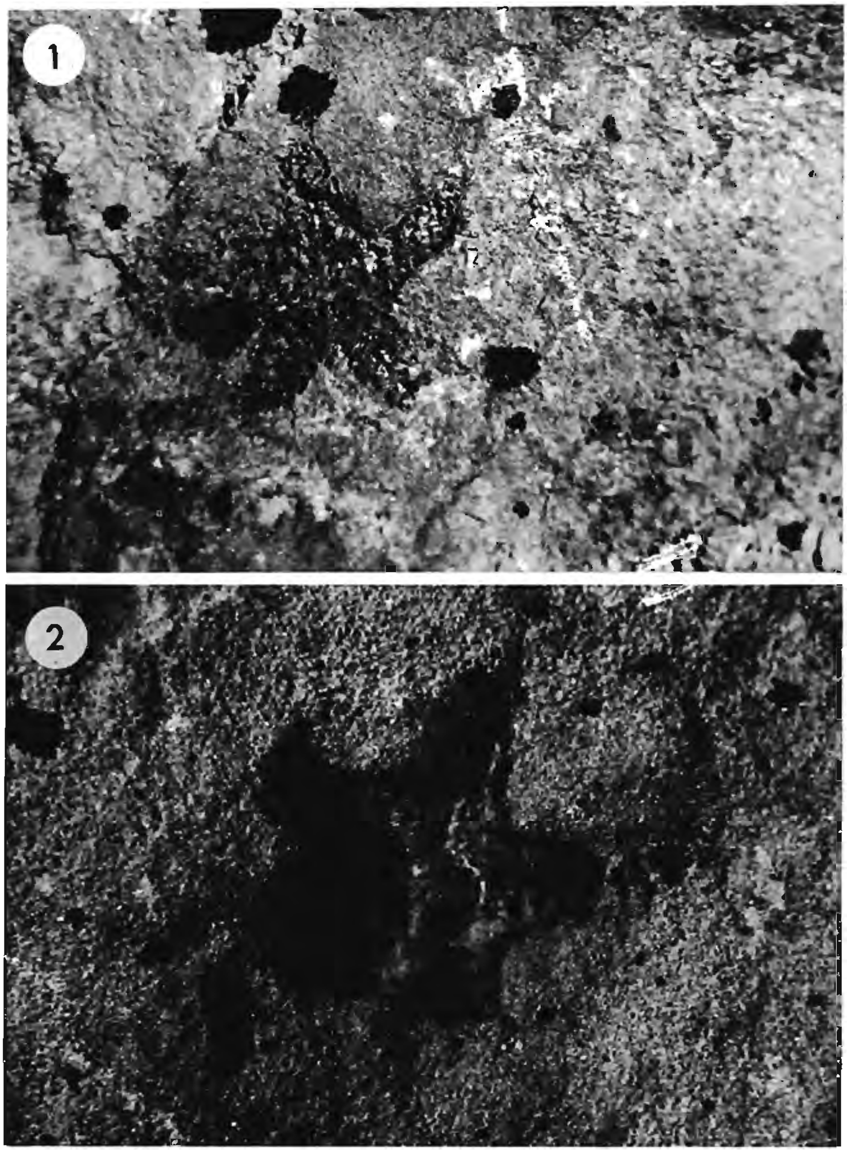
Specific characters: Star-shaped, five-rayed, extremities of arms blunt, ambulacrals alternating, five ambulacrals to a column. Laterals relatively small. Interradial area of disc poorly developed and apparently covered by a single plate. Mouth skeleton not well developed. Aboral side and other characters unknown.

Dimensions: Diameter 1,4 cm to 1,75 cm. Disc diameter 6 mm to 8 mm. Breadth of arm at junction of the disc 3 mm and at tip 1 mm. Diameter of mouth 1,75 mm to 2 mm. Ambulacrals occupy 1 mm each.

Material: Two slabs, South African Museum No. 3881 (fig. 1) contains the type and fragments of another individual. South African Museum No. 3375 (fig. 2) contains a less perfectly preserved individual.

Locality: No. 3375 Hottentots Kraal, No. 3881 Hottentots Kloof, both Ceres District, SOUTH AFRICA.

Horizon: Cape System, Bokkeveld Series, No. 3375 the lowest shale bed C_2l_s, No. 3881 base of the second shale bed C_2m_s; both slabs are composed of the soft reddish or brownish felspathic sandstone which according to Du Toit (1939: 218) lies sandwiched between these two zones.



Figs. 1-2. *Haughtonaster reedi* gen. et sp. nov. (1) No. 3881, holotype, (2) No. 3375, South African Museum.

Discussion: Reed (1925: 32–33) determined these specimens as members of the genus *Echinasterella* and, according to the classification then accepted, Gregory (1900: 257), he was correct. This species is very primitive; it is only the nature of the laterals which prevent it being included in the Somasteroidea, while the nature of the ambulacrals prevent its being included in the Asteroidea. The species is now placed in the family Eophiuridae because it shares with *Eophiura bohemica* Jaekel the alternating ambulacrals and blunt extremities of the arms, regarded as typical by Spencer and Wright (1966: U82). However it differs from the type and only species of *Euphiura* in being smaller; in its arms being broader and shorter; in apparently not possessing any spines, and in possessing a different body structure to that figured by Schuchert (1915; fig. 20). These differences are sufficiently great to prevent its being included in the genus *Eophiura*. This species cannot be referred to the Encrinasteridae because its arms differ considerably from those of species classified in this family. It is therefore desirable to create a new genus and a new species to contain it. Reed compared it to the South American species *Echinasterella darwini* Clarke; Schuchert (1915: 200–201) has redescribed this South American species which differs from the South African in being three times the size and in possessing ambulacrals which are opposite.

Order	Oegophiurida	Matsumato (1915)
Suborder	Lysophiurina	Gregory (1896)
Family	Protasteridae	S. A. Miller (1889)
Genus	*Taeniaster*	Billings (1858)

Taeniaster stuckenbergi sp. nov.

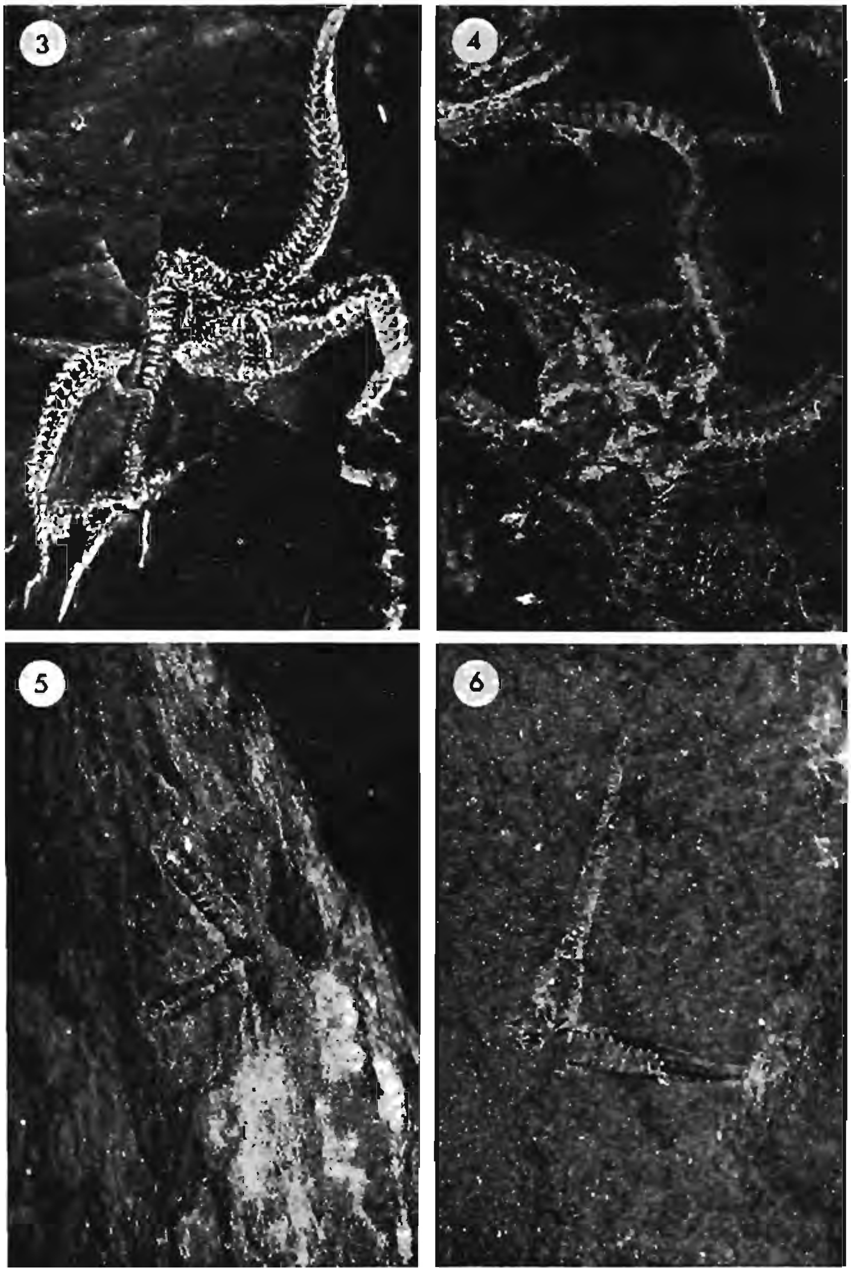
1925 *Aspidosoma* sp. F. R. C. Reed *Ann. S. Afr. Mus.* **22**: 33.

Specific characters: Central disc pentagonal, slightly rounded, girdled by fragile ossicles; aboral surface smooth; disc apparently soft and delicate, covering plates small and thin. Oral skeleton conspicuous, syngnaths almost touch, buccal plates very small. Arms long, length thrice the diameter of the disc. Ambulacral furrow narrow, exposing a double row of ambulacrals. Ambulacral ossicles alternate, legs of ambulacral boots narrow; side shields contiguous and bear short spines, four to a shield. Other characters unknown.

Dimensions: The disc diameter ranges from 11 mm to 16 mm, the longest and therefore most complete arm belongs to the smallest individual and is 36 mm from its junction with the disc to its tip. The arms are 4 mm broad at their point of union with the disc and 0,5 mm at their tip. A series of six ambulacrals occupy about 5 mm length of the arm. The lateral spines are 0,5 mm to 1 mm long and the oral skeleton has a diameter of 5 mm. The syngnaths on the better preserved of the two specimens on the Albany Museum slab are very distinct and are 1,6 mm long, 0,34 mm wide and 0,11 mm apart.

Material: Two slabs, one Natal Museum Catalogue No. 831 (figs. 3, 4), Type No. 1550, contains four specimens of which the largest is designated the holotype. The other, Albany Museum No. 2610 (figs. 5–6), contains two specimens neither of which is as well preserved as any on the Natal Museum slab.

Locality: Cold Bokkeveld north of Ceres, SOUTH AFRICA, exact locality unknown.



Figs. 3-6. *Taeniaster stuckenbergi* sp. n. (3–4) No. 831, Natal Museum; (5–6) No. 2610, Albany Museum.

Horizon: Cape System, Bokkeveld Series, probably the lowest shale bed C_2l_s. Rossouw (1933: 76) found *Ophiurites* sp. near Prince Albert in this bed; furthermore he (1964: 23) states that this bed is slightly micaceous. This bed contains abundant fossils, though the next shale bed is similar lithologically, is also fossiliferous and can therefore not be excluded. Du Toit (1939: 218) says that in the north-west the third shale band is more micaceous and the fourth distinctly flaggy, which would seem to eliminate them as the source of our specimen.

Discussion: Reed (1924: 33), working on poorly preserved material and basing his opinion on the nature of the ambulacrals, assigned this species to the genus *Aspidosoma*; in doing so he must have visualized the soft parts of the animal as similar to those of *Hexura weitzi* Spencer (1950: 301). According to Spencer & Wright (1966: U84) some of the early German workers also assigned members of the Encrinasteridae to this genus. This species is referred to the genus *Taeniaster* on the grounds that as well as the typical ambulacrals it has the soft delicate disc and laterals bearing short spines which Gregory (1897: 1033) associated with this genus. The poorly developed marginal ossicles are merely a thickening of the edges of the disc and are not a well-developed marginal frame. This species has affinities with the genus *Mastigophiura* but cannot be assigned to this genus as it lacks the large spines on the disc. This species differs from the type species *Taeniaster spinosa* Billings as figured by Spencer & Wright (1966: fig. 4) in that the spines are not as well developed and the arms are proportionately longer and narrower. Our species differs from *Taeniaster elegans* Miller as described by Schuchert (1915: 22) in being somewhat over twice the size and in having four spines to a side shield, while *Taeniaster elegans* only has one spine to a side shield. *Taeniaster stuckenbergi* is very much larger than the Australian species *Hallaster parvus* Withers & Keble (1934: 203); this Australian species was at one time classified as *Taeniaster* aff. *spinosa* Billings. The systematic position of *Ophiurites* sp. (Rossouw, 1935: 76) is problematical; however even if it were referred to the genus *Taeniaster*, our species would differ from it by being more than twice the size.

CONCLUSIONS

Asterozoa are animals which disintegrate rapidly after death if not immediately buried, and apparently in the Cape geosyncline deposition was too slow to preserve many of them. This is to be regretted as the South African Palaeozoic Ophiuroids are a very interesting assemblage. All have alternating ambulacrals and could thus have had a common ancestry. *Haughtonaster reedi* is very primitive and must be close to the ancestral stock of the Class Stelleroidea; its closest relative is confined to the Lower Ordovician (Upper Arenig) of Czechoslovakia. *Hexura weitzi* is a member of a rather more evolved family, the Encrinasteridae, examples of which are known from the Lower Ordovician to the Lower Carboniferous. *Taeniaster stuckenbergi* is a member of a family which is known from the Middle Ordovician (Trenton group) to the Lower Carboniferous. *Ophiurites* sp. is badly preserved and its exact position will remain in doubt; however basing our opinion purely on the position of its madreporite and disregarding the ambulacrals, it is possibly a member of the Lapworthuridae, brittle-stars which are known from the Lower Ordovician to the Lower Devonian. Thus it would appear that the Cape geosyncline was an evolutionary backwater where primitive forms were able to persist and more advanced forms did not evolve. The presence of fragments of individuals of the two species described in this paper would lead us to believe that even these primitive forms may have possessed the faculty of self-mutilation (autotomy) and were able to replace lost parts.

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